REMARKS

After the foregoing Amendment, claims 1, 4 – 9, 18 – 20, 22 – 29, 35 – 39, 41, 43 – 45, 47 – 51, 53 – 57, 60 – 63, and 65 are pending in this application. Claims 3, 58, 59, 64 and 66 are cancelled without prejudice. Claims 1, 37, and 65 are amended. Support for the amendments can be found at can be found at pages 6, 8, 15, 16, 17, 21, 32, and 59 – 61. Applicant submits that no new matter is introduced into the application by these amendments.

Allowable Subject Matter

Applicant thanks the Examiner for indicating that claims 37, 62, 63, and 65 are allowed. Claim 37 was previously amended to recite "microelectronics," but its dependent claims 62 and 63 still recited "means." The amendment herein reverts the language of claim 37 back to "means."

Claim Rejections - 35 USC §112, second paragraph

The Action rejects claims 3, 55, 56, 58, and 59 as indefinite. Applicant cancelled claims 3, 58, and 59 only to expedite prosecution and their rejection is moot. Amendment of the base claim 37 obviates the §112, second paragraph rejections of claims 55 and 56 and Applicant respectfully requests withdrawal of the same.

Claim Rejections - 35 USC §112, first paragraph - enablement

The Action rejects claims 1, 3 – 9, 18 – 20, 22 – 29, 35, 36, 38, 39, 41, 43 – 45, 47 – 51, 53, and 55 – 61 and states that the written description does not enable these claims. Claims 3, 58, and 59 are cancelled and their rejection is moot.

The Action characterizes the claims as restricted to the embodiment depicted in Figure 21. The Action also describes the embodiment as requiring a step of DNA elongation and biotinylation *via* transferase prior to formation of a conductive bridge on the elongated biotinylated DNA "skeleton." In particular, the Action indicates the elongation step is required in order for gold colloids to "grow and merge" and form a conductive bridge. Based on this interpretation, the Action states that "the claims do not recite the essential elements which are required to form a conductive coating over the oligonucleotide probes and the target nucleic acid molecules which would allow an electrical current to be carried between the probes... ."

Figures 21A – 21F illustrate the embodiment described in Example 12 (pages 46 – 47) and is merely one embodiment of the claimed invention. Many other embodiments are described.

> The specification states:
>
> Depending on the nature of the target, the recognition moiety may be a single-stranded nucleic acid sequence or a double stranded sequence with a sticky end, an antibody, a receptor, a lectin, a sugar, an antigen, etc. The recognition moiety and the target are thus members of an affinity group: one member of the affinity group is the target, the other member of the group serves as the recognition moiety.
>
> The recognition moiety may be immobilized on the electrode and/or on a non-electrode substrate present between the electrodes, by the use of linkers which may be selected from a wide variety of molecules... .

Page 20, underlining emphasis added. And targets include anything that bind these recognition elements, including bacteria. See Example 18. Based on these teachings, the skilled artisan would readily appreciate that any recognition moiety, not just the nucleic acid depicted in Example 12, could be positioned in the gap separating electrodes.

With respect to the nucleation forming entities, the specification describes numerous substances in addition to gold colloids. One embodiment includes silver ions but specifically states that a wide variety of other ions can be used, including but not limited to cobalt, copper, nickel, gold, metal aggregates, semiconductor particles, and complexes or clusters (*e.g.*, colloidal gold, colloidal silver, gold clusters, *et cetera*). Page 31. Also, conductive polymers (negative or positively charged, polymers with recognition groups that bind a complex, polymers including n-type or p-type conductors, *et cetera*) may be utilized. Page 33. Based on this

teaching, the skilled artisan would readily appreciate that many substances other than gold colloids could be utilized as nucleation forming entities to practice the claimed invention.

Introduction of nucleation centers via biotinylation and binding of steptavidin-colloidal gold, as describe in Example 12, is but one embodiment described. The specification specifically states that nucleation centers may form simply by introducing nucleation forming entities to a sample and adding a reducing agent. Page 31, 20 – 21, 38, 47, *et cetera*. Prior to introduction of the reducing agent, the nucleation forming entity may be attached to the complex through general interactions such as ionic interactions. Pages 31 -33; Example 8, pages 41 – 43; Example 9, pages 42 – 45. Or, the nucleation reagent can be specifically attached to nucleic acid (page 31 and Example 12, pages 46 – 47); to an antibody or antigen (Example 13, pages 47 – 48); to a molecule that binds a bacterium (Example 18, pages 51 – 52); *et cetera*. Based on these teachings, the skilled artisan would readily understand that nucleation forming entities can be introduced by various general or specific interactions in order to practice the claimed invention.

Whether the nucleation forming entity is introduced *via* general or specific interactions, the specification states that exposure to reducing conditions allows "ions [to be] converted to metal only at nucleation sites and consequently the

nucleation centers grow and merge with each other to form a conductive functionalized bridge... ." Page 31, underlining added. As clearly stated, there is no requirement for DNA elongation, biotinylation, or streptavidin – colloidal gold in order for nucleation center to grow and merge. The skilled artisan would readily understand that nucleation center growth and merger is due to reduction of metal ions or the like, rather than the specific manner in which a nucleation forming entity was introduced.

Indeed, even when the complex involves nucleic acids, the skeleton elongation step described in the Action is not always required. See Example 24, pages 56 – 57 and Figure 30. In Example 24, nucleic acids are derivatized with streptavidin – gold and in the gap between electrodes. *Id.* And the process of gold deposition does not require skeleton elongation. *Id.* Instead, solutions of Au and reducing agent are added, reduction occurs, gold deposits "grow and merge" and a conductive bridge forms. *Id.*

Based on the foregoing, the skilled artisan would readily understand that the skeleton elongation described in the Action is not required in order to form a conductive bridge. And gold colloid is not the only possible nucleation forming entity. Rather, the skilled artisan would readily understand how to make and use the claimed invention, even in the absence transferase-biotin-streptavidin-gold, without undue experimentation. Although these features, in whole or in part, are

within the scope of the present invention, the claims do not fail to recite an essential element.

Applicant respectfully submits that the 35 U.S.C. §112 enablement rejection of claims 1, 4 – 9, 18 – 20, 22 – 29, 35, 36, 38, 39, 41, 43 – 45, 47 – 51, 53, 55 – 57, and 60 – 61 is improper and requests withdrawal of the same.

Claim Rejections - 35 USC §112, first paragraph – written description

The Action rejects claims 1, 3 – 9, 18 – 20, 22 – 29, 35, 36, 38, 39, 41, 43 – 45, 47 – 51, 53, and 55 – 61, stating that the claims are not supported by the original specification; that "this is a new matter rejection." Claims 3, 58, and 59 are cancelled and their rejection is moot.

The Action states that the claims "embrace the target molecules and recognition moieties being nucleic acids as well as proteins and antibodies." Underlining original. The Action further requests Applicant "to point out specifically wherein the specification the currently claimed embodiment is shown as being contemplated for the target molecule being protein and the recognition moiety being antibodies, wherein the reagents which allow extension of a conductive bridge across the two electrodes are affected (as depicted in Figure 21)."

"The subject matter of the claim need not be described literally (i.e., using the same terms or *in haec verba*) in order for the disclosure to satisfy the description

requirement." MPEP § 2163.02. Instead, the written description needs only to show the skilled artisan that the Applicant invented what is claimed. *Id.*

The originally filed specification states:

> Depending on the nature of the target, the recognition moiety may be a single-stranded nucleic acid sequence or a double stranded sequence with a sticky end, an antibody, a receptor, a lectin, a sugar, an antigen, etc. The recognition moiety and the target are thus members of an affinity group; one member of the affinity group is the target, the other member of the group serves as the recognition moiety.
>
> The recognition moiety may be immobilized on the electrode and/or on a non-electrode substrate present between the electrodes, by the use of linkers which may be selected from a wide variety of molecules... .

Page 20, underlining emphasis added. Further, Example 24 describes nucleic acids in the gap but "extension of a conductive bridge across two electrodes" does not require the specific transferase extension step as described in the Action. Example 24, pages 56 – 57. Instead, extension of the conductive bridge occurs through ligands attached to the nucleic acid. Through Example 24, the application describes "extension of a conductive bridge across the two electrodes" that the skilled artisan would understand as completely adaptable to a protein based embodiment; *i.e.*, a ligand can be attached to a protein as well as to a nucleic acid. And Example 13 teaches antibody – antigen affinity pairs.

Based on the general description of the invention and the examples within the written description, the skilled artisan would immediately envision the

inventions claimed, even those that include antibodies or proteins within their scope.

Based on the foregoing, the originally filed application supports the claims and there is no new matter in this application. Applicant respectfully requests withdrawal of the 35 U.S.C. §112, first paragraph rejection of claims 1, 4 – 9, 18 – 20, 22 – 29, 35, 36, 38, 39, 41, 43 – 45, 47 – 51, 53, 55 – 57, and 60 – 61.

Claim Rejections - 35 USC §103

The Action rejects claims 64 and 66 as obvious. Applicant cancels claims 64 and 66 only to expedite prosecution and the rejection is moot.

Conclusion

If the Examiner believes that any additional matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing amendment and remarks, Applicant respectfully submits that the present application, including claims 1, 4 – 9, 18 – 20, 22 – 29, 35 – 39, 41, 43 – 45, 47 – 51, 53 – 57, 60 – 63, and 65, is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

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